

DETAILED ACTION

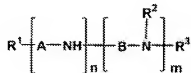
The examiner acknowledges the receipt of applicants' arguments dated 04/11/2011.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. **Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cameron (WO 90/11317) in view of Nalwa (Journal of Materials Science, 26 (1991) p. 1683-1690).**
2. **Regarding Claims 1-3,** the applicant also claims a charge transporting varnish represented by Formula 1:

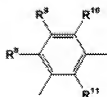


Formula 1

where R¹-R² are H, monovalent hydrocarbon group or organoxy group, R³ is an unsubstituted or substituted aryl group, A and B are divalent groups represented by Formula(s) 2 or 3:

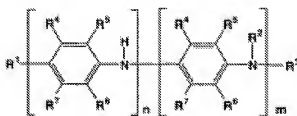


Formula 2



Formula 3

Applicants' formula 1 can also be represented by formula 4:



formula 4

The formula can also be represented as the quinonediimine derivative.

Cameron discloses conductive polymers which include Formula C-1 (page 1):



Cameron discloses that polyaniline polymers (Formula C-1) can be linked with a polyimide and the copolymer can be in a solvent (page 4, lines 5-17).

Cameron further discloses that the molecular weight of Formula C-1 can be 800 to 900 can be used (page 10, lines 17-20). Applicant claims a molecular weight of 250-800.

The molecular weight is viewed as a cause effective variable to control the solubility of the polymeric material. A polymer with a molecular weight that is too high would be expected to be insoluble in common solvents.

Applicant and Cameron teach molecular weight ranges which are not exactly the same but do show a portion of the ranges which overlap, it would have been obvious to one of ordinary skill in the art at the time of the invention to have adjusted the molecular weight of the copolymer (Formula C-1/polyimide) to achieve a material that was soluble in a solvent which would have included the overlapping portion of the ranges, absent unexpected results.

Formula C-1 shows A and B are phenyl groups which correspond to the phenyl groups in Formula 4. R1-R7 in Formula C-1 are considered to be hydrogen atoms as Cameron does not show any additional substitution (per claim 3).

Cameron fails to mention phenyl as an end-capping group.

Nalwa discloses that an oligoanilines can be end-capped with a phenyl group (page 1689).

The examiner takes the position that the nitrogen on the far right in Formula C-1 represents the reactive site for propagation.

Whereas Cameron does not mention the means to terminate the oligomer growth and Nalwa discloses the phenyl group can be used as an end-capping group, it would have been obvious to a person of ordinary skills in the art at the time of the invention to have selected from

known end-capping groups which would have included the phenyl group as disclosed by Nalwa which reads on applicants' limitation for the R3 position, absent unexpected results (per claim 2).

3. **Regarding Claim 4**, Cameron in view of Nalwa teach the invention of claim 1. Cameron fails to teach m+n as less than or equal to 6.

The molecular weight of the copolymer affects the ultimate solubility of the copolymer. Polymers with molecular weights that are too high would be expected to have lower solubility in a solvent.

With a reasonable expectation of success, a person of ordinary skill in the art would have tested a series of polymers with varying (different value of m +n) molecular weight ranges to determine which range give suitable solubility properties which would have included the range claimed by the applicant, absent unexpected results.

4. **Regarding Claims 5**, Cameron in view of Nalwa teach the invention of claim 1. Cameron fails to teach the weight ratio of polyaniline to polyamide. Applicant claims a % wt. of 0.1 to 50 wt. %.

The polyaniline (Formula C-1) level is viewed as a cause effect variable to control the conductive properties of the copolymer. A polyaniline content that was too low would be expected to result in a material with insufficient conductivity.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to have adjusted to weight range of the polyaniline to optimize the conductivity of the oligomer which would have included the claimed range, absent unexpected results.

5. **Regarding Claims 6,** Cameron in view of Nalwa teach the invention of claim 1.

Cameron fails to mention the molecular weight of the polyimide material. The applicant claims 1,000-50,000.

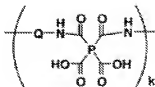
Cameron teaches that the polyimide component needs to have a low melting temperature to make the copolymer processable (page 4, lines 17-20).

The molecular weight of the polyimide is viewed as a cause effective variable to control the melting temperature. A polyimide with a molecular weight that was too high would not be expected to have a low melting temperature.

As Cameron teaches that a low melting polyimide is required to ensure processibility, it would have been obvious to one of ordinary skill in the art at the time of the invention to have adjusted the molecular weight of the polyimide which would have included the claimed range, absent unexpected results.

6. **Claims 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cameron (WO 90/11317) in view of Nalwa (Journal of Materials Science, 26 (1991) p. 1683-1690) and Oka (JP-07-090179).**

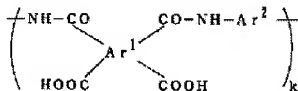
Regarding Claim 7, applicant claims a polyimide precursor represented by Formula 8:



where Q can be a divalent phenyl group and P can be a tetravalent phenyl group.

Cameron in view of Nalwa teaches polyaniline-polyimide copolymers but fails to mention the claimed polyimide.

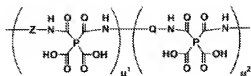
Oka discloses a charge transporting substance made of a charge transporting polyaniline and a polyimide (abstract). The polyimide component can be represented by Formula O-2 (below) which shows a tetravalent organic group corresponding to applicants' P group (Formula 10) and a divalent Ar² group corresponding to applicants' Q group (paragraph 4).



O-2

As Cameron in view of Nalwa and Oka teach polyaniline-polyimide copolymers as conducting materials, it would have been obvious to one of ordinary skill in the art at the time of the invention to have selected from known polyimide used in polyaniline-polyimide copolymers which would have included the polyimides of Oka (Formula O-2) which reads on the instant limitations, absent unexpected results.

7. **Regarding Claims 8 and 9**, the applicant claims a polyimide precursor represented by formula 21:



Formula 21

Z and Q are divalent groups. Z is selected from applicants' formula(s) 22-27.

Cameron in view of Nalwa teaches polyaniline-polyimide copolymers but fails to mention the claimed polyimide.

Oka discloses a polyimide precursor represented by O-2 (shown above). Oka also discloses that the polyimide precursor can be made by the reaction of a tetracarboxylic dianhydride or tetracarboxylic ester or tetracarboxylic acid halide with a diamine (paragraphs 9 and 10).

Oka further discloses that other diamines based on phenylenediamine and diaminobiphenyl (Z groups, the class of compounds listed in applicants' structures 22-27 in claim 9) can be used to make polyimides precursors that are analogous to applicants' Formula 21. The phenylenediamine or diaminobiphenyl compounds can have the following groups attached: methylenebis (aniline), bis (aminophenoxy) benzene, bis (aminophenoxy) biphenyl and bis [(aminophenoxy) phenyl] propane.

Oka also indicates the above groups can be further substituted (defined as W in the applicants' structures 22-27) with halogens, alkoxy (methoxy, ethoxyl, propoxy) groups, or alkyl groups (methyl, ethyl, propyl) (paragraph 9 and 10).

In essence, Oka discloses a polyimide precursor that can contain both Z and Q groups.

As Cameron in view of Nalwa and Oka teach polyaniline-polyimide copolymer as conducting materials, it would have been obvious to one of ordinary skill in the art at the time of the invention to have selected from known polyimide derivatives used in polyaniline-polyimide copolymers which would have included Oka who teaches a combination of diamine species defined as Z and Q groups in Formula 21 to make suitable polyimide precursors through a reaction with a tetracarboxylic derivative, absent unexpected results.

8. **Claims 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cameron (WO 90/11317) in view of Nalwa (Journal of Materials Science, 26 (1991) p. 1683-1690) and further in view of and Kin (JP-11-185962).**

9. **Regarding Claims 10 and 11,** Cameron in view of Nalwa teach the invention of Claim 1 but fail to mention a charge transporting thin film or usage in an organic electroluminescent device.

Kin discloses a doped polyaniline (charge transporting substance) (paragraphs 28-30) and the dopant can be benzenesulfonic acid (charge transporting dopant) (paragraph 30). The polymers are soluble in organic solvent (paragraph 39).

Kin also discloses a thin film layer (charge transporting varnish) (paragraph 32) as a component of an electroluminescent device (abstract).

As Kin discloses a similar type of conducting polyaniline material to Cameron, it would have been obvious to a person of ordinary skill in the art at the time of the invention to have used

the polyaniline materials of Cameron in known applications which would have included as a thin film layer in an electroluminescent device as taught by Kin, absent unexpected results.

The end-capping groups of Cameron in view of Nalwa was addressed above.

Response to Amendments

Applicant arguments are based on the previous rejections which relied on Oka for the polyaniline and polyimide components.

The current set of rejections are based on Cameron for the polyaniline and polyimide components in view of Oka for the polyimide-arylamine component. As the basis of the rejections has changed, applicants' arguments will not be addressed in this non-final office action.

Conclusion

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GREGORY CLARK whose telephone number is (571)270-7087. The examiner can normally be reached on M-Th 7:00 AM to 5 PM Alternating Fri 7:30 AM to 4 PM and Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer Chriss can be reached on (571) 272-7783. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mark Ruthkosky/
Supervisory Patent Examiner
Art Unit 1785

GREGORY CLARK /GDC/
Examiner
Art Unit 1786